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ABSTRACT

In 1988, the Commonwealth Association of Polytechnics in Africa (CAPA) in collaboration with the International Labour Organization established a pilot project to address the issue of underrepresentation of women in technical education and training. The Women in Technical Education and Training Project (WITED) was based on six key strategic elements necessary to increase and maintain women's participation. The elements were as follows: (1) contact and cooperation with an international and regional network of institutions; (2) institutional involvement in project design and implementation; (3) pilot action research phase; (4) training and awareness raising for the project staff; (5) policy seminar; and (6) information dissemination. Research explored women's participation in technical training and employment and the main obstacles. Findings indicated that the number of women enrolling in polytechnics had increased gradually, but women were only 24 percent of the students. The average participation rate in technical programs was 12 percent. Fifteen percent of polytechnic teachers were women. Women represented 4 percent of all technical workers. Barriers were grouped under three main headings: those found in education and training systems and policies, in employment, and in society. Changes were recommended in four main target areas: national level, primary and secondary school systems, technical and vocational training systems, and formal sector employment. (Appendixes include a 16-item bibliography and 6 tables.) (YLB)

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by Sue Leigh-Doyle

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Discussion Paper No. 90

Increasing women's participation in technical fields
A pilot project in Africa

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I. Background

The under-representation of women in scientific, technical and vocational education, training and employment has become an issue in almost every part of the world. In the United States, throughout the 1970s, generous funding was provided for National Science Foundation grants for "women and science" projects. In the United Kingdom the Girls into Science and Technology (GIST) programme was initiated in 1979 as an action-research project which took concrete steps to improve girls' achievement in science and technology and also investigated the reasons for their underachievement. In 1984 the Equal Opportunities Commission (EOC) and the Engineering Council designated the year "WISE 84" (Women into Science and Engineering), and in 1986 the Engineering Industry Training Board (EITB) launched specific initiatives to encourage girls to apply for engineering apprenticeships and degree courses. The Women in Science and Technology Programme in Australia (WISTA) project, based at the University of Queensland, is currently examining the factors which influence women's access to and progress in science and technology at the higher education level. Slow but definite progress towards the participation of women in technical fields in Asia has been reported by the ILO Asian and Pacific Skill Development Programme (APSDEP) as a result of research and initiatives aimed at diversifying training for women.[1]

Clearly, then, the issue of under-representation of women in technical education, training and employment is not unique to Africa. The difference, which is one of degree rather than of kind, must be viewed in the context of the serious economic and developmental problems facing many African countries. In a recent ILO study on women teachers in technical and vocational education in three African countries (Kenya, Malawi and Zambia), the author comments that "the most conspicuous problem confronting anyone studying the position of women teachers in the technical and vocational area is their absence".[2]

Ten years ago Phiri looked at the under-representation of female students in technical education and vocational training in Zambia. He noted that boys accounted for almost 80 per cent of the students accepted by the Department of Technical Educational and Vocational Training in Zambia for the teaching of middle-level technical skills.[3]

World Bank statistics show that the overall share of females in vocational and technical education in 39 sub-Saharan countries increased by only 1 percentage point in the period 1970-83, from 27 to 28 per cent of all participants.[4] In 1988 the ILO highlighted the extent to which women were under-represented in formal training in Africa. Vocational and technical students were estimated to average only around five per cent of all secondary school students; this limited availability of organised training was especially marked with respect to women who, as a group, encounter particular difficulties in gaining access to suitable training.[5]

Research published in 1986 confirms that only a small number of all modern sector employees in Africa are women, and that their participation is linked to their level of education. The case studies carried out in Côte-d'Ivoire, Egypt, Nigeria and Tanzania show that in industry women generally hold low-skill, low-paid jobs which provide limited opportunities for promotion. Both formal and informal barriers systematically exclude them from certain types of job. Very few women are managers, and although larger numbers of women are now in senior scientific and professional posi-

tions, they still represent a very small proportion of those employed in this category. Many female employees are laboratory technicians and practically none are intermediate-level technicians or artisans.[6]

Many reasons have been suggested for the worldwide under-representation of women in science and technology. Harding identifies three main factors which influence participation in science, technology and mathematics education: society's assumptions about men and women (their abilities, behaviour, roles and aspirations); the objectives of education and how it is organised; and the practical application of science, technology and mathematics. The politics and culture of any given society reflect these factors.[7]

In 1987 Lockheed and Gorman made a comprehensive review of the literature published since 1985 and found that most studies reporting sex-related differences in science achievement offer a variety of socio-cultural reasons for these differences: the pressure of society, the absence of suitable role models, the masculine image of science, parental expectations and beliefs, differential treatment by teachers, and the home and peer environment.[8]

In 1988 Byrne identified ten core factors which influence women's access to and progress in scientific and technological disciplines at the higher education level. Negative factors include curricular prerequisites and choices, the crucial role played by mathematical ability as a filter allowing access to the sciences, and career guidance. Positive factors include same-sex role models, women's support networks and affirmative action (in the curriculum or in the institution). Factors which can operate either negatively or positively depending on circumstances are male and female peer group attitudes, the attitudes of teachers and lecturers, the role of mentors, single-sex or mixed education and the popular image of science and technology.[9]

A 1985 ILO study indicates that factors limiting the demand for women workers may also be associated with employers' attitudes regarding the higher costs they represent as a result of pregnancy, maternity protection, absenteeism, turnover and, in some countries, cultural restrictions on women's activities.[10]

In its report on Women and the Industrial Development Decade in Africa, the African Training and Research Centre for Women makes a distinction between formal and informal barriers to women's participation in industrial employment. Formal barriers include a lack of technical education or training, certain labour laws and a lack of quotas or targets to promote higher female participation in training. Informal barriers include customs and religious practices, management and worker attitudes, and the attitudes of women themselves. While there was a shortage of technical and scientific labour in the four countries studied, few women had chosen to attend technical schools or trade centres in order to learn the necessary skills.[11]

II. The ILO/CAPA project

In 1988 the Commonwealth Association of Polytechnics in Africa (CAPA) in collaboration with the ILO established a pilot project to address the issue of under-representation of women in technical education and training. The ILO/CAPA Women in Technical Education and Training Project (WITED) was based on the six key strategic elements described below, each of which was necessary to increase, then maintain, women's participation in technical education and training.

A. Contact and co-operation with an international and regional network of institutions

For there to be a significant long-term rise in the number of female participants in technical and vocational training it was essential that the project have the support and commitment of a number of institutions. Having a regional and international network of institutions involved in the project was also seen as important from the point of view of credibility, making the participation of women in technical subjects a central rather than a marginal issue. Raising people's awareness and distributing information on the subject were also easier within such a network.

CAPA, being itself a network of institutions committed to the improvement of technical, vocational and professional education and training, provided a solid framework for the project. The CAPA network spans over 100 institutions in 15 English-speaking African countries. Furthermore, the CAPA directorate had already expressed concern about the persistently low participation rate of women in its various staff development programmes, the virtual lack of women involved in the planning, management and implementation of technical and vocational training and the small number of female trainees in technical and vocational training programmes within the institutions.

B. Institutional involvement in project design and implementation

A wide range of staff members from the CAPA institutions were involved in the project design and implementation from the outset. The benefits of this involvement were:

- a greater awareness of the issues affecting women's participation in the institutions;
- acknowledgement by senior personnel of the reality of the problem and commitment to solve it in their own institutions;
- realisation that this issue is not unique to any institution, region or country in Africa; and
- acknowledgement of the need for further research to identify the causes of the problem and decide how best to remedy them.

A WITED Task Force was set up comprising CAPA top management, key directors of polytechnics, some female polytechnic staff members, specialists to act as "resource persons" nominated by CAPA and the ILO. This 15-member planning group was responsible for identifying the central themes and issues to be addressed by the project, and for settling on the terms of reference and the scope of its action-research phase. A project coordinator was nominated from within the CAPA secretariat, and polytechnic staff members were named as regional coordinators and researchers. College principals showed their support by releasing polytechnic staff members to work on the project, by granting access to information and by participating in a policy seminar.

C. The pilot action-research phase

A pilot action-research phase was agreed as an essential first step towards collecting the necessary data. Carrying out research within the CAPA system across 15 countries provided an opportunity to contribute both quantitatively and qualitatively to a better understanding of the issues influencing women's participation in technical education, training and employment in different countries and regions in Africa.

The Task Force agreed that the research should focus on: (a) actual levels of female participation in the primary and secondary school systems, in the polytechnic system and in employment in technical fields; and (b) relevant policy issues.

As the factors influencing women's participation were known to be complex and inter-related, information and views were required from a wide range of sources. Nine groups of people were identified by the Task Force as being the most suitable sources of information:

- heads of primary schools;
- heads of secondary schools;
- heads of polytechnics and technical training institutions;
- female staff in polytechnics and technical training institutions;
- female students in polytechnics and technical training institutions;
- personnel managers in industry and parastatal organisations;
- women employed in industry and in public and parastatal enterprises and organisations;
- policy-makers in the ministry of education and vocational training; and
- policy-makers in the ministry of labour.

A common systematic approach to the research was agreed upon to facilitate comparative analysis across countries and regions. Questionnaires were designed for each of the nine categories and were adjusted to specific country conditions.

Nominations for institutions and personnel to participate in and carry out the research were sought throughout the CAPA network, as a wide range of countries, regions, institutions and technical courses was essential. Twenty polytechnics and technical institutions in nine countries in western, southern/central, and eastern Africa (Botswana, the Gambia, Ghana, Kenya, Malawi, Nigeria, Tanzania, Uganda and Zambia) were selected for the research. Details of the research locations and primary data sources are shown in table 1.

The researchers were selected on the basis of their previous research experience and their interest in the issues to be investigated. Nineteen women and one man conducted the research; most of them taught technical subjects in polytechnics.

D. Training and awareness raising for the project staff

Training of the project staff was also essential. A number of training workshops were organised for the three regional project coordinators and the 20 polytechnic lecturers who were to carry out the research. The training workshops had several aims: raising awareness of sex-related issues, providing refresher courses on social science research methods and report writing, and making sure the research fieldwork and analysis were carried out in a systematic manner. Workshops were held on a regional basis to allow differences between regions and countries to be identified and incorporated into the research design and the survey questionnaires.

E. Policy seminar

A regional policy seminar evoked widespread commitment and support for future action in this area. The seminar was convened following the pilot action-research phase and brought

together almost 100 people, including representatives from 36 CAPA member institutions in 12 countries, senior government officials from technical ministries in 14 countries, representatives of employers' federations, and a limited number of international donor agencies and other organisations with an interest in the subject. Recommendations for future action to be carried out at policy, training institution and enterprise levels were drawn up - building on the findings of the research and papers presented to the seminar and agreed upon by the seminar participants. The combined recommendations from the policy seminar and the research provided CAPA with a basic framework for planning future strategy and action.

F. Information dissemination

A variety of methods was used to publicise the large volume of information collected during the research process. As the aim was to reach a wide range of target groups including policy-makers, heads and staff of schools and training institutions, employers and the media, a combination of approaches was considered necessary. Research reports, posters and videos were prepared for use first at the policy seminar and then for a wider audience.

The first video was aimed chiefly at policy-makers, and presented the views, attitudes and experiences of a female student, a woman lecturer and a woman employee in non-traditional technical fields in Kenya; and then the opinions and impressions of policy-makers, employers, parents, training institution directors, and the Secretary General of CAPA. The second video was mainly for use by vocational counsellors and teachers, and presented profiles of women who had successfully broken into non-traditional fields and the problems and opportunities encountered along the way.

A synthesis report of the main research findings and policy implications was prepared for the policy seminar.[12] Considerable emphasis was placed in this report on using the research findings to help policy-makers, heads of technical and vocational training institutions, and employers to improve the access of women to non-traditional training and employment.

Three regional reports were also prepared, describing the current situation in each of the regions, and identifying the measures necessary to achieve the same result.[13] The research questionnaires were also reproduced.[14]

Posters portraying women in non-traditional technical jobs and a promotional flier were also prepared and distributed.

III. Main research findings[15]

The polytechnics in the CAPA network are higher education institutions which offer full and part-time courses at a variety of levels (certificate, diploma, higher national diploma). Only a few polytechnics currently offer degree-level programmes. The majority have a range of technical programmes in engineering, science and technology, environmental studies and agriculture. About one-third also offer business, arts and culture, and technical teacher training programmes.

Courses range from one to four years in length, with periods of industrial attachment forming an integral part of all courses. Recruitment procedures vary from country to country, with open admissions in some countries (e.g. Nigeria) and sponsoring by industry or the government in others (e.g. Kenya). The number of students enrolled varies considerably both between and within countries, ranging from under 200 (Lilongwe Technical College, Malawi) to over 8,000 (Yaba College of Technology, Lagos, Nigeria).

Requirements for entry also vary. Generally a minimum of four or five credits (i.e. a good pass mark) in the final secondary school examinations is needed for admission to a diploma course and a minimum of two or three credits for a certificate-level programme. In the majority of institutions credits in science and mathematics are essential to enrol for an engineering or science and technology diploma programme. Good marks in technical drawing and other technical subjects are also essential. For the purposes of the research, the polytechnic programmes which were defined as "technical" covered science and technology, engineering, agriculture, environmental studies and technical teacher training.

We consider below the principal findings on women's participation in technical training and employment and on the main obstacles to such participation.

A. Women's participation in technical training and employment

Women's participation was examined from several angles: as students, teaching staff, and managers or administrators. Women's and men's overall levels of participation as students and staff were compared, as were their levels of participation in technical programmmes and courses.

1. Female students in polytechnics

The research revealed that while there had been a gradual increase in the number of women enrolling in polytechnics over the previous few years, there were still very few women students (24 per cent overall). With regard to purely technical programmes the average participation rate was considerably lower (12 per cent) (table 2). Of this 12 per cent, most female students were enrolled in science, environmental studies and agriculture programmes which are often considered "soft" options. Very few women were enrolled in engineering programmes. The contrast between the very low female participation rates in engineering courses (ranging from 1 to 11 per cent) and those in science and technology courses (6 to 39 per cent) in selected polytechnics in Nigeria and Ghana in 1989 may be seen in table 3. Female students following technical programmes in polytechnics were found to compete favourably with male students. They had no special difficulties in their industrial attachments and their employers said that they performed well.

2. Female staff in polytechnics

The main categories of staff in polytechnics were: senior administrative and management staff, academic teaching staff and instructors, technicians, clerical and other support staff. The research revealed a low level of female staff overall in the polytechnics, especially in senior administration and management positions and academic teaching posts. On average 15 per cent of teachers in polytechnics were women. However, most of them taught non-technical subjects such as arts, culture and business studies. Women made up an average of only nine per cent of teachers in technical programmes, and 20 per cent of polytechnics employed no female teachers at all in their technical programmes. As was the case for female students, most female teachers were involved in the science and technology and environmental studies programmes, and very few taught engineering-related subjects. Table 4 gives figures for the distribution of teaching staff in selected polytechnics in eight African countries in 1989. These selected polytechnics were the colleges with the highest student enrolment in each country; three of the eight had no female teaching staff in technical programmes. Table 5 illustrates the concentration of female teaching staff in science and technology programmes by comparison with engineering programmes in institutions surveyed in Nigeria.

The female teaching and senior administrative staff are similarly qualified but generally have fewer years of service than their male counterparts. Some principals and female teachers thought this was one of the reasons why there were so few women in senior posts such as principal, vice-principal, registrar or head of department. Most female teachers and senior staff expressed interest in career advancement, but felt they needed additional training and development in order to progress further.

3. Women in technical jobs in industry

Research was also carried out on the employment of women in technical jobs in industry and in parastatal organisations: 176 organisations were surveyed in nine countries; all had some links to the polytechnics through either employee sponsorship, industrial attachments or graduate employment. The vast majority of employees in these enterprises and parastatal bodies are men.

On average, women represent four per cent of all technical employees; they are just as likely to be employed in higher-level technical management and technical supervisory jobs as in lower-level technician and craft jobs. Table 6 illustrates the distribution by sex in enterprises and parastatal organisations in seven African countries.

Many (male) employers said they were reluctant to recruit qualified women into technical jobs. They felt that women, because of their physiological make-up, were unable to cope with the rigours and physical requirements of technical jobs. However, they conceded that the women presently employed in technical jobs in their companies performed as well as their male colleagues doing similar technical work.

B. Main constraints on women's participation

A number of factors constitute barriers to women's participation in technical training and employment. Some of these barriers are "formal" in that they are linked to institutional policies, practices and procedures; others are "informal", being mainly socio-cultural in nature and arising from stereotyped attitudes and beliefs about women's roles and capabilities. While the range of formal and informal barriers is complex and inter-related, the research highlighted the fact that the same barriers are to be found in all the African environments studied.

Barriers to women's participation may be grouped under three main headings: those found in education and training systems and

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policies, in employment, and in society as a whole.

1. Barriers in education and training systems and policies

Girls are up against barriers in the education and training system right from the start. As emerged especially from the interviews with heads of primary and secondary schools, girls typically receive a poor foundation in mathematics and science subjects at primary level, and very little exposure subsequently to technically oriented subjects. This in turn limits their participation and performance in these subjects at secondary school and their access to technical programmes at the higher education level. Most girls' secondary schools do not offer technical subjects such as metalwork, woodwork and technical drawing as part of the curriculum.

Role models can influence girls' career choices, but as so few women teach science and technical subjects at the secondary and higher education levels, girls have little chance of being positively influenced by them.

Women's participation is also constrained by an almost total lack of support by the responsible government ministries. The absence, within the ministries of education, training and labour, of formal structures designed to promote women in the field of technical education, training and employment contributes to the lack of systematic positive action taken to adjust the present imbalance. In some countries there are no women's bureaux or councils. There is a lack of effective machinery to monitor women's integration into technical education and training. Training institutions are never evaluated in terms of women's participation levels and their annual reports rarely provide data disaggregated by sex.

2. Barriers in employment

The main constraints and barriers to women's participation in technical jobs were found to result from negative attitudes and a lack of support facilities. Employers' stereotyped attitudes regarding women's abilities and competence in technical areas mean that few women are recruited. Silent discrimination and stereotyping also exist in many organisations, with the result that even women already in employment are not always given the opportunity to prove their worth and have their career prospects limited. There tends to be a lack of support facilities and working conditions (such as part-time and flexible working hours, job-sharing schemes, child care, transport) provided by employers for women employees with family responsibilities. The fact that there is no legislation governing the provision of such facilities does not help matters. The existence of legislation relating to night work, shift work and work in specific occupations (e.g. mining), which was originally designed to protect women, was found in some cases to act as a barrier to employment opportunities in technical fields. The lack of financial support or sponsorship enabling women to undertake further technical training is also a barrier to their possible promotion and career development.

3. Socio-cultural barriers

Social and cultural factors were generally felt to be the greatest constraint on women's participation in technical education, training and employment. Attitudes revealing sex-stereotyping on the part of parents, community leaders, the media and society at large encourage the impression that technical jobs and technical education and training are the exclusive preserve of men. Religious attitudes also act as a break in some countries, particularly in the northern regions of the Gambia, Ghana and Nigeria where women's participation in technical fields is not at all favoured.

The research showed that women's own attitudes towards their roles and capabilities influenced their entry into certain technical fields. From an early age, many women lack confidence in, and have a negative attitude towards, science and technical subjects. In fact, women often actually expect to fail in these

subjects because of negative experiences at primary school level and in the home and community. The role conflict for a woman acting as a mother, wife and worker as well as the unequal division of household and child-rearing responsibilities are further constraints. Employers tended to assume erroneously that women were more likely than men to be absent from work owing to family responsibilities.

IV. Recommendations arising from the research

The research results clearly highlight the urgent need to increase the level of participation of women in technical education, training and jobs as students and trainees, as academic staff and managers of training institutions, and as employees. Action must be taken in a number of different spheres: the primary and secondary school systems; polytechnic and training institutions; enterprises; policy-making organisations; and in the family and community as a whole. As so many factors influence women's participation, no single group, sector or agency can bring about change alone; responsibility must be shared amongst policy-makers in education, training and labour ministries, heads of technical and vocational training institutions, employers and employers' federations, heads of primary and secondary schools, and parents' associations and community groups. Task forces made up of representatives of each of these interest groups should be formed in each country to maximise the effectiveness of initiatives through a coordinated and integrated approach.

Changes are essential in four main target areas: at the national level; in the primary and secondary school systems; in the technical and vocational training systems; and in formal sector employment.

(i) At the national policy level, it was urged that education ministries in each country should review and examine the reasons for the poor performance of girls in science, mathematics and technical subjects at primary and secondary levels and take appropriate remedial action. Special awards and scholarships should be granted by ministries of education and training to encourage women to attend technical and vocational training institutions, and steps should be taken to recruit more women into technical teacher training programmes. Sex equality issues should become part of the curriculum of all teacher training courses. Reviews of curriculum content, training materials and delivery methods should be carried out to eliminate sex-stereotyping and sex biases in science, mathematics and technical subjects. Special women's units or departments should be set up in the ministries of education and labour and be responsible for drawing up and implementing policy initiatives to increase women's participation. Every year these units should monitor the progress made by technical and vocational training institutions to increase female participation at all levels.

(ii) All primary and secondary schools should have adequate equipment and facilities to teach science and technical subjects. Exposure to technical subjects should be mandatory for all students at primary and up to early secondary level. Special efforts should be made by ministries of education to select and recruit women to teach technical subjects at these levels in order to serve as role models and to ensure a more balanced representation of male and female teachers. Girls at primary and secondary schools should be more exposed to technical opportunities through career counselling, information leaflets, videos and brochures on new employment openings, and through visits to technical and vocational institutions and enterprises.

(iii) Within the technical and vocational training system, specific policies for enrolling women in technical courses should be developed and various strategies for recruiting them should be explored, including increased sponsorship by government and employers, and self-sponsorship.[16] Top-up and bridging programmes should be set up in the short term for women students who may otherwise fall short of entry requirements for technical programmes. These bridging courses in applied mathematics and technical skills would give

girls and women a second chance to acquire the same knowledge required for entry as that possessed by their male counterparts. A media campaign could be launched to attract women to technical and scientific careers. Technical and vocational training institutions should themselves undertake promotional campaigns. There should be a system of annual scholarships to enable a selected number of women to participate in technical programmes, and a system of awards for female students. Accommodation and other support facilities should be provided to enable and encourage more women to enrol. Employment service staff and industrial liaison officers in training institutions should be trained to ensure they do not convey biases in their own attitudes and encourage and assist employers to recruit qualified women. Heads of institutions should ensure that a sufficient number of females are employed in technical teaching and instructing posts to act as role models for women students. Quotas or targets for higher female participation should be set and adhered to. Systematic staff development programmes should be established within training institutions, taking into account the special needs of women staff, and special scholarships should be granted to female staff in technical programmes. Training workshops to increase awareness of sexual equality issues should be attended by all teaching and management staff.

(iv) In the formal sector, national federations of employers should create awareness amongst their members of the need for increased sponsorship and recruitment of women into technical training and jobs. Employers should ensure that women employed in technical jobs have the same access to promotion, further training and career development opportunities as their male counterparts.

V. Conclusions

The WITED pilot action-research project has been effective in creating awareness within the polytechnic system and within government ministries of the magnitude of the problem of under-representation of women in technical programmes, the factors which have led to this situation, and the measures needed to redress the imbalance.

The research has shown that this problem and its underlying causes are similar in all institutions, regions and countries in Africa. Because of the scale and complexity of the problem, the wide-ranging measures outlined above will be needed to ensure lasting change. Strategies to promote greater participation of women in technical education and training should aim to achieve a minimum of 30 per cent female representation in the next ten years. Short-term, positive-action measures will be needed to reach this minimum "critical mass" of female participation; these should include scholarships, grants, awards and the establishment of top-up or bridging programmes. Support facilities should be provided in technical and vocational training institutions, including guidance, counselling, employment placement services, hostel accommodation, child-care facilities and transportation.

To ensure that female role models and mentors are available to girls in secondary schools, education ministries should set short-term targets for women to enter technical teacher training courses. Governments should also ensure, as a priority, that sex-neutral career guidance is made available to secondary school pupils.

Of particular value in this context is the encouraging fact that, through their participation in the project's training workshop and the research process itself, polytechnic staff members gained a heightened awareness and knowledge of these issues. These staff members will play an important role in the future development of institution-based strategies to combat the problem. Similarly, the commitment, awareness and support developed during the regional policy seminar will be of invaluable use in the project's forthcoming implementation phase.

Media campaigns are urgently required to raise women's awareness of the opportunities open to them in technical training and employment and to encourage a reassessment of the traditional role of women.

These recommendations and others identified in the policy seminar and as a result of the research phase are currently being incorporated into an action plan to be implemented with the CAPA network over the coming five years. The ultimate objective is of course to assist in increasing women's participation in industrial and technological development. The strategy proposed includes policy initiatives, advocacy measures, information dissemination, support to special interest groups, educational measures, studies and investigations. As a first step, heads of polytechnics within the CAPA network recently met to agree on the overall framework of the action plan and to pledge their commitment to implementing the proposed measures within their individual polytechnics.

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15 A fuller account of the main research findings outlined below is given in ILO/CAPA, op. cit.

16 Some polytechnics require their students to be sponsored by an employer. This militates against women and girls, who are less likely to be in employment.

15 BEST COPY AVAILABLE

Table 1. Summary of primary data sources in CAPA/ILO WITED research in Africa: Numbers interviewed March-May 1989

Country & location	Heads of primary schools	Heads of secondary schools	Heads of polytechnics	Female Poly. staff	Female Poly. students	Employers in industry/ parastatals	Female technical employees in industry/ parastatals	Policy-makers
Botswana								
Gaberone	5	6	1	5	15	5	10	2
The Gambia								
Banjul	7	7	1	3	14	6	5	2
Ghana								
Accra	6	11	1	9	6	12	9	4
Takoradi	6	10	1	8	5	10	10	2
Kenya								
Nairobi	5	3	1	12	27	13	16	2
Eldoret	5	6	1	5	12	18	11	1
Malawi								
Lilongwe	5	10	1	3	2	7	12	1
Blantyre	5	9	1	7	15	8	10	1
Nigeria								
Lagos	5	16	1	10	30	20	20	2
Calabar	4	6	1	15	25	10	10	2
Ilorin	6	14	1	11	20	8	9	2
Abeokuta	5	13	1	9	20	10	15	1
Tanzania								
Dar es Salaam	5	8	1	17	20	10	27	2
Tabora	5	6	1	4	28	8	16	2
Mwanza	5	9	1	5	16	11	14	2
Mbeya	5	6	1	7	29	14	4	2
Uganda								
Kampala	3	4	1	3	25	3	6	2
Zambia								
Lusaka & Ndola	22	11	3	12	27	14	22	3
Total	**109**	**155**	**20**	**145**	**336**	**187**	**226**	**35**

Note: "Polytechnics" covers polytechnics and other technical training institutions.

Table 2. Student enrolment in selected polytechnics in nine African countries, 1989

Polytechnic	All programmes		Technical programmes	
	Total students	% female	Total students	% female
Yaba College of Technology, Nigeria	8510	25	3862	12
Kenya Polytechnic, Nairobi, Kenya	3488	24	2627	17
Accra Polytechnic, Ghana	2498	30	1083	1
The Polytechnic, Malawi	1033	14	664	3
Dar es Salaam Technical College, Tanzania	955	7	955	7
Botswana Polytechnic	621	5	621	5
Uganda Polytechnic	566	9	566	9
Technical Training Institute, The Gambia	532	40	265	11
Northern Technical College, Zambia	495	2	495	2

Source: ILO/CAPA: *Women in technical trades* (Geneva, 1990), table 5, p. 57.

Table 3. Participation rates of female students in science and technology and engineering programmes in selected polytechnics in Ghana and Nigeria, 1989

Polytechnic	Science and technology		Engineering	
	Total students	% female	Total students	% female
Ghana				
Accra Polytechnic	55	5	1028	1
Nigeria				
Yaba College of Technology	854	27	1772	6
Kwara State Polytechnic	70	39	802	11
The Polytechnic, Calabar	152	33	332	5

Sources: Compiled from unpublished research reports on the factors influencing the participation of women in technical education, training and jobs, prepared by authors from the respective polytechnics.

Table 4. Distribution of teaching staff in selected polytechnics in eight African countries, 1989

Polytechnic	All programmes		Technical programmes	
	Total staff	% female	Total staff	% female
Yaba College of Technology, Nigeria	284	19	179	16
Kenya Polytechnic, Nairobi, Kenya	270	22	203	6
The Polytechnic, Malawi	117	12	72	1
Dar es Salaam Technical College, Tanzania	119	15	104	11
Botswana Polytechni	120	3	114	0
Uganda Polytechnic	100	3	100	3
Technical Training Institute, The Gambi	40	5	34	0
Northern Technical College, Zambi	58	2	57	0

Source: ILO/CAPA, op. cit., table 7, p. 59.

Table 5. Distribution of teaching staff by sex in technical programmes in selected polytechnics, Nigeria, 1989

Polytechnic	Science and technology			Environmental studies			Engineering		
	M	F	% F	M	F	% F	M	F	% F
Yaba College of Technology	42	21	33	45	5	10	63	3	5
Kwara State Polytechnic	44	6	12	25	2	7	117	4	3
The Polytechnic, Calabar	57	12	17	22	1	4	53	1	2
Ogun State Polytechnic	30	10	25	11	1	8	14	0	0

Sources: Nigerian reports mentioned in table 3, plus report on Ogun State Polytechnic, Nigeria.

Table 6. Distribution of technical employees by sex in selected enterprises and parastatal organizations in seven African countries, 1989

Country	Enterprises & parastatals	Males	Females	% female
Nigeria	48	24747	978	3.8
Tanzania	43	3540	222	5.9
Ghana	22	6525	169	2.5
Malawi	15	8736	32	0.36
Zambia	6	3292	21	0.63
The Gambia	6	951	15	1.6
Botswana	5	1802	65	3.5

Source: ILO/CAPA, op. cit., table 10, p. 62.